

Table E-11. Selected Fungicides and Bactericides Labeled for Greenhouse Use

NOTE: Some states define pesticide applications in high tunnels as greenhouse applications, others define them as field applications. Check with your extension educator or state department of agriculture for correct application. If any information in this table is inconsistent with the label, follow the label.

Fungicide	Target Diseases	Labeled Crops	Comments
Azadirachtin + Neem oil (DeBug Tres, Debug Turbo, Agro Logisitic Systems, Inc.) REI =4 h.	Nematodes. <i>Sclerotinia sclerotiorum</i> and <i>S. rolfisii</i> diseases	Cucurbits, fruiting vegetables and others (see label)	OMRI listed¹.
Azoxystrobin (Heritage, Syngenta Crop Protection, LLC) REI=4 h.	Rhizoctonia, leaf spots and others	Brassica, cucurbit, fruiting vegetables and others	Vegetable and herb plants grown for transplanting
Azoxystrobin + benzovindiflupyr (Mural, Syngenta Crop Protection LLC) REI=12 h.	Powdery mildew, leaf mold, leaf spots and others.	Tomatoes, cucurbits	Vegetable plants for re-sale to consumers. Do not make more than two applications per crop.
<i>Bacillus amyloliquefaciens</i> (Stargus, Marrone Bio Innovations) REI=4 h.	Bacteria blight, bacterial spot, Late blight, grey mold, downy mildew, and other diseases	Cucurbits, tomatoes, peppers, leafy vegetables and other greenhouse-grown vegetables	OMRI listed¹. Can be used as a soil drench for soilborne diseases or as a foliar spray. Apply prior to disease infection.
<i>Bacillus pumilus</i> (Sonata; Bayer CropScience LP) REI=4 h.	Early blight, late blight, downy mildew, powdery mildew	Many vegetables including Brassicas, cucurbits, bulb, fruiting, and leafy vegetables and root and tuber crops	Can be used for organic production¹. Preventative biological fungicide.
<i>Bacillus subtilis</i> (Cease, BioWorks). REI= 4 h.	Suppression of soilborne and foliar diseases including damping off, root rot and early blight	Many vegetables including fruiting and leafy vegetables, cucurbits, cole crops and herbs	May be used in hydroponic and soilless production systems. Most effective used preventatively.
Basic Copper Sulfate (Cuprofix Ultra 40 Dispers; United Phosphorus, Inc.) REI=48 h.	Many diseases including angular leaf spot, downy mildew. <i>Alternaria</i> blight, <i>Anthracnose</i> , bacterial blight, etc.	Vegetables including cucumbers, eggplant, peppers, tomatoes, etc.	Can be used for organic production¹. Crops grown in the greenhouse may be more sensitive to copper injury so the user should determine plant sensitivity.
<i>Burkholderia</i> spp. (Majestene Bionematicide, Marrone Bio Innovations) REI=4 h.	Root-knot, lesion, sting, stunt, ring and other nematodes	Brassica, bulb, cucurbit, fruiting and leafy vegetables	OMRI listed¹. Take soil samples prior to planting to assess nematode populations.
<i>Coniothyrium minitans</i> (Contans, Sipcarn Agro) REI=4 h.	<i>Sclerotinia sclerotiorum</i> , <i>Sclerotinia minor</i>	Many vegetables including leafy vegetables, brassicas, legumes, fruiting vegetables and bulb vegetables. <u>Cannot</u> be used on tomato.	OMRI listed¹. Contains a beneficial fungus. Do not allow to stand overnight following mixture. Acts as a preventative.
Copper Hydroxide (Kocide 2000, DuPont) REI=24/48 h.	Leaf spots, anthracnose and bacterial spots and others	See labels for specific crops	See labels for specific usage instructions. Phytotoxicity may occur.
Cuprous Oxide (Nordox, Monterey AgResources) REI=24 h.	Bacterial spot and speck, <i>Alternaria</i> leaf spot, anthracnose, early and late blight, etc.	Eggplant, pepper and tomato	See label for specific usage instructions.
Cyazofamid (Ranman, FMC Corporation) REI=12 h.	<i>Pythium</i> damping off Basil downy mildew	Tomato greenhouse transplant production and basil	Drench transplant tray with fungicide at planting or up until one week before transplant. See label for additional details.

Fungicide	Target Diseases	Labeled Crops	Comments
Dazomet (soil fumigant) (Basamid G, Amvac) For entry restrictions, see label	Pre-plant control of soilborne diseases	Soil treatment only	Restricted Use Pesticide – see label for precautionary statements, restrictions, and directions for use.
Dicloran (Botran, Gowan Company) REI=12 h.	Pink rot, gray mold, <i>Sclerotinia</i> and <i>Sclerotium</i> rots, leaf blight and neck rot	Many vegetables including celery, lettuce, onions, garlic and shallots	May cause leaf bronzing on lettuce. Use adequate volume of water.
Fenhexamid (Decree, Arysta LifeScience) REI=4 h.	<i>Botrytis</i>	Tomatoes, cucumber, pepper, lettuce, and eggplant	Protectant fungicide with some plant back restrictions. See label for details.
Fludioxonil (Emblem, Nufarm) REI=12 h.	Alternaria leaf blight, Cercospora leaf spot, gummy stem blight, powdery mildew, early blight, gray mold, Septoria leaf spot, and Sclerotinia rot	Brassica (Cole) crops, cucurbits, tomatoes and other fruiting vegetables, leafy greens	Good coverage is essential for disease control. Use good resistance management practices (see label for information).
Horticultural Oil (Ultra-Pure Oil, BASF) REI=4 h.	Powdery mildew	Cucurbits, melons, squash, tomatoes, oriental vegetables and others	Application should be made when disease is first noticed. See label for information on plant safety. Use lower label rates in the greenhouse.
Hydrogen Dioxide (Oxidate, BioSafe Systems LLC) REI=1 h.	<i>Anthracnose</i> , downy mildew, powdery mildew, <i>Pythium</i> root rot and other diseases	Many vegetables including cole crops, cucurbit, leafy vegetables, peppers and tomatoes	Strong oxidizing agent. Contact, oxidizing sanitizer. (Active ingredient: hydrogen peroxide).
Kaolin (Surround WP, Nova Source Tessenderlo Group) REI=4 h.	Powdery Mildew	Cucurbit and other vegetables	OMRI listed ¹ . Product forms a white clay film on leaves and fruit. Reduces sunburn and heat stress.
Mancozeb (Dithane M-45, DF, Dow AgroSciences LLC) REI=24 h.	Leaf spot diseases, seed treatment for damping off, seed rots and seedling blights	Tomatoes and others	Broad-spectrum protectant fungicide.
Mandipropamid (Micora, Syngenta) REI=4 h.	Downy mildews, blue mold, and late blight, and suppression of <i>Phytophthora</i> blight	Some vegetables and basil grown for transplant and retail sale to customers	Registered for closed greenhouses with permanent flooring on transplants for re-sale to consumers.
Pentachloro-nitrobenzene PCNB (Terraclor 400, Amvac) REI=12 h.	Root and stem rot, damping off (<i>Rhizoctonia solani</i> , <i>Pellicularia filamentosa</i>)	Vegetable bedding plants. Limited to container-grown broccoli, Brussels sprouts, cabbage, cauliflower, peppers and tomatoes.	Apply as a soil drench in nursery and greenhouse to seedlings grown in containers prior to transplanting. See label for additional information.
Penthiopyrad (Fontelis, DuPont) REI=12 h.	Many diseases, including gummy stem blight, <i>Sclerotinia</i> stem rot, leaf spots, powdery mildew and <i>Anthracnose</i>	Tomatoes, eggplant, peppers and edible peel cucurbits	See label for specific usage instructions.
Phosphorous acids – mono and di-potassium salts (Fungi-Phite, Verdesian Life Sciences U.S., LLC; Rampart, Loveland Products) REI= 4 h.	Root rots, damping off downy mildew, suppression of bacterial diseases (see label)	Cucurbit, fruiting vegetable and leafy vegetable crops	See label for pre-plant seedling tray application instructions.
Potassium Bicarbonate (Milstop, BioWorks, Inc.) REI=1 h.	Powdery mildew and others	Many vegetables including cabbage, cucumber, eggplant, broccoli, cauliflower, lettuce, peppers, tomatoes and squash	OMRI listed ¹ . Works by contact. Potassium bicarbonate disrupts the potassium ion balance in the fungus cell, causing the cell walls to collapse.
Potassium Salts of Fatty Acids (M-Pede, Gowan) REI=12 h.	Powdery Mildew	Cucurbits, fruiting, leafy, root and tuber vegetables and others	OMRI listed ¹ . Contact fungicide. See label for details.

Fungicide	Target Diseases	Labeled Crops	Comments
Propamocarb Hydrochloride (Previcur Flex, Bayer Crop Science) REI=12 h.	<i>Pythium</i> root rot and damping off	Tomatoes, leaf lettuce, cucurbits and peppers	See label for specific usage instructions.
Pyraclastrobin plus Boscalid (Pageant Intrinsic, BASF Corp) REI=12 h.	<i>Botrytis</i> grey mold	Transplant and greenhouse-grown tomatoes, cucurbits and leafy greens	Pageant Intrinsic is also labeled for greenhouse use on transplants grown for the home consumer market
Pyrimethanil (Scala, Bayer Crop Science) REI=12 h.	Early blight and gray mold, <i>Botrytis</i>	Tomatoes and greenhouse grown cucumber	Use in well-ventilated houses only and ventilate two hours after application.
<i>Reynoutria sachalinensis</i> (Regalia, Marrone Bio Innovations) REI=4 h.	Many diseases including powdery mildew	Cucurbits, bulb vegetables, Fruiting vegetables and others	OMRI listed¹.
<i>Streptomyces lydicus</i> (Actinovate, Novozymes BioAg, Inc.) REI=1 h.	Damping off and root rot, pathogens <i>Pythium</i> , <i>Rhizoctonia</i> , <i>Phytophthora</i> , <i>Verticillium</i> ; and foliar diseases including downy and powdery mildew and <i>Alternaria</i> and <i>Botrytis</i> .	Greenhouse vegetables and herb crops	OMRI listed¹. May be applied to soil or foliage through mist systems or sprayer.
Streptomycin Sulfate (Agri-mycin 17, Nufarm Americas, Inc.) REI=12 h.	Bacterial spot, bacterial speck	Tomatoes and peppers grown for transplant	Repeated applications can result in resistant bacteria. Do not apply through any irrigation system.
Sulfur (Microthiol Disperss, United Phosphorus, Inc.) REI=24 h.	Powdery mildew	Crucifers, cucurbits, peppers and tomatoes	OMRI listed¹. Crops grown in greenhouses may be more sensitive to sulfur injury, so the lowest label rate should be tried initially. Do not use within two weeks of an oil spray treatment.
Thiophanate-methyl (3336 WP, Cleary Chemicals LLC) REI=12 h	Anthrachnose, gray mold, sclerotinia, gummy stem blight, powdery mildew and others	Dry and succulent beans, and cucurbits for transplant.	Caution: Some populations of the pathogens that cause gummy stem blight, grey mold and powdery mildew, are resistant to thiophanate methyl.
<i>Trichoderma harzianum</i> (PlantShield, Rootshield, Bioworks, Inc.) REI=4 h.	<i>Pythium</i> , <i>Rhizoctonia</i> , and <i>Fusarium</i> . When applied as a foliar spray, suppresses <i>Botrytis</i> and powdery mildew.	Greenhouse vegetables	Contains a beneficial fungus. Avoid applications of fungicides at least one week before or after application. Acts as a preventative. Will not cure diseased plants.
<i>Trichoderma virens</i> GL-21 (formerly known as <i>Gliocladium virens</i>) (SoilGard 12G, Certis USA LLC) REI=0 h.	Damping off and root rot, pathogens <i>Pythium</i> and <i>Rhizoctonia</i>	Food crop plants in greenhouse	Has preventative activity only, will not cure already diseased plants. Allow treated soil to incubate for one day prior to planting for best results. Do not use other soil fungicides at time of incorporation.

¹The National Organic Program (NOP) maintains a list of products that are approved for use in organic production. In addition the Organic Materials Review Institute (OMRI) maintains a brand name list of products that approved for use. Some fungicides that are approved for use in organic production have been reviewed by the Environmental Protection Agency (EPA) for NOP compliance and will have a three-leaf logo and the words “for organic production” on the label.